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ABSTRACT

Behavioral research and educational technology are discussed as influences on curriculum design. Developments in the technology of special education are described, with attention to both systematic instruction and to automated and nonautomated media for display and measurement. New factors of curriculum design are reviewed, including the role of design as total programming and examples of the application of new design. A summary and 89-item bibliography are also provided. (JD)

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NEW CURRICULUM DESIGN IN SPECIAL EDUCATION

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NEW CURRICULUM DESIGN IN SPECIAL EDUCATION

Norris G. Haring

A curriculum is a plan for the arrangement of information and experiences which educators consider necessary for children to cope successfully with life. This general view of curriculum involves the teacher in arranging the variables of instruction to produce the behavior sought--an approach that encompasses what to teach, how to teach, and how to improve teaching (Bellack, 1969). The child and his own development, as well as the final goals of instruction, are influences on the final design of the curriculum. Consequently, curriculum designed effectively starts with the child at his level of entering behaviors and guides him efficiently and effectively toward terminal objectives. The overview that follows identifies the influences from which the newly emerging curriculum design in special education has arisen and, in addition, discusses the developments resulting from these influences, as well as examples of their application to exceptional children.

Influences on the New Curriculum Design

A clear picture reflecting the exact influences on curriculum design is not available, for researchers have not yet begun to analyze experimentally these forces outside the curriculum (McNeil, 1969). However, it seems apparent that three types of influences have had impact on the new design in the curriculum of special education. The increased awareness of educators of the need to specify instructional objectives in ways that

can be measured has had significant results. Influences upon curriculum have taken the form of (a) programs which individualize instruction; and (b) programs which require active responses from children. Behavioral research and technological developments have provided additional impact. Behavioral research has helped educators to identify behaviors that can be measured during performance. Technology has provided the tools both for instruction and measurement (Blackhurst, 1965).

The interaction of these influences eliminates the possibility of identifying one which might have functioned as the dominant factor. Even the specific contributions of each are difficult to pinpoint, for upon close inspection one seems to have arisen from the other and yet parallel developments are also at times apparent. It has become obvious through the review, however, that the influences of behavior principles and the tools of technology have, throughout their mutual development, interacted quite significantly upon advances in special education curriculum.

Behavioral Research as an Influence

Behavioral objectives. The most important influence on special education has been a recognition of the importance of specifying the terminal objectives of instruction around which to design the curriculum. The need to specify terminal objectives as observable behavior (Mager, 1962) became obvious as research in the behavioral sciences (Honig, 1966) began to have impact on education (Ferster & Perrot, 1968; Haring, 1969; 1970). This need has placed the educator in the position where he can be specific

about behavioral requirements of specific curricula, which, in turn, has made it possible for him to arrange an instructional program in a sequence that involves successive approximations (Lumsdaine, 1965), i.e., progressive steps, that lead toward terminal objectives.

Behavioral approach to handicapped children. The influence of behavioral research has, in addition to this contribution, been much more pervasive, for it has provided a behavioral approach to the identification and management of exceptional children. While, as categories, the medical and psychological classifications have offered some function in classifying children, they have proven to be non-functional as the teacher deals with learning and behavior in the classroom. Consequently, special educators have begun to view the handicapped child in terms of his educational deficits (Stolurow & Davis, 1965). The child may be seen to have deficits in pre-academic or academic skills, or, where indicated, he may lack vocational skills useful to him. The child may lack language skills that are essentially verbal behavior. He may lack the social skills (Patterson & Reid, 1969) necessary for behavioral interactions involved in cooperation, competition, and exchange (Lindsley, 1966; Mithaug, 1970a; Mithaug, 1970b). Or the child may be deficit in behaviors considered sensory-motor skills. Identification of exceptionalities in terms of observable behavioral deficits provides information specific to making decisions for modifications that can be accomplished in an educational setting.

This behavioral view of the exceptional child has had two major effects on special education. One has been the realization that the

effects of environmental modifications can change some deviancies in development. This has brought educators to focus on very early identification and treatment of handicapping patterns of development (Public Law 90-538) almost at the prevention stage. The growing awareness that learning results from a process of instruction (Mowrer, 1969) is a second major effect of this view. Kopstein's (Hickey, 1968) definition of teaching is an apt representation: ". . . a rigorous definition of teaching must be the complement of an accepted definition of learning. Any generally acceptable, operational definition of learning shows teaching to be simply a beneficial control and regulation of a learner's stimulus environment" (p. 45).

Adaptation of procedures of experimental analysis. Research in the behavioral sciences has also provided a set of procedures--experimental analysis (Skinner, 1965; Sidman, 1960)--which, in varying adaptations, has become the newest curriculum design in special education. Application of procedures of experimental analysis in the classroom has provided the teacher with a functional way to plan, implement, and evaluate a curriculum designed to satisfy specific terminal objectives.

Educational Technology as an Influence

Development of programmed materials. The long recognized need for an effective means of individualizing instruction (De Cecco, 1964) has produced the demand; the technology of education (Skinner, 1968) has responded with self-instructional programs in which children can perform at their own rates. This demand has proved to be the second greatest

influence on special education (Carson, 1969), an influence which credits this field as giving birth to the movement to individualize instruction (Ofiesh, 1969).

The precision made possible by a programmed arrangement of materials to be learned has greatly assisted educators in teaching children with learning deficits. This to some degree explains the rapidly spreading application of programmed instruction in special education. Programmed materials, as a form of instruction, meet the requirements for individualization to the degree that the specific program develops the specific skills for which it was designed (Lange, 1967). Too many programs fall short of instructional objectives, a fault of the programmer, whose responsibility it is to make his program instructional through a series of behavioral evaluations prior to marketing the product (Markle, 1967). Programmed instruction in special education, as in regular education, is gaining a new breadth of meaning to include the total programming (Haring & Lovitt, 1967) of a learning environment for a specific portion of the total classroom session.

Development of instrumentation. Programmed instruction has been instrumental in the development and use of the teaching machine, which, in turn, has served as a catalyst for the introduction of the computer (Bushnell & Allen, 1967). The computer (Jerman & Suppes, 1969; Robertson, 1968), when introduced into education, made possible a more refined application of these earlier influences. One refinement has been that terminal objectives can be stated more precisely in behavioral terms, enabling software (the curricula, per se) to be programmed, evaluated and

revised. In addition, the computer offers refinements in curriculum developments because of its potential for sorting bits of information into sequencing and branching arrangements. Through the use of the computer (a) more precise behavioral objectives can be implemented; (b) bits of information can be arranged in linear and branching sequences; and (c) feedback can be obtained that is essential to program revisions. The availability of computerized instrumentation for display of instructional stimuli and for measurement of performance to obtain a continuous evaluation of performance has accelerated the scientific progress of education.

Development of systems analysis. Probably the final influence, whose impact is just beginning to be felt, is a systems approach (Saettler, 1969; Carson, 1969; Ofiesh, 1968) to curriculum design. Systems analysis (Stolurow, 1967), as applied to education, has developed along with programmed instruction and computer programming because of the nature of the requirements for the design and evaluation of both. It is a dimension of technology, not necessarily automated, which provides a framework within which a curriculum (a) can be designed to meet specifically defined objectives, (b) can be implemented as planned, and (c) can be evaluated, then modified on the basis of the evaluation in order to approximate more closely the terminal objectives. At the present time, however, as far as the teacher in the special classroom is concerned, a systems analysis is more a model for administrative strategy in decision making than a tool for instruction. Systems analysis will prove to be

especially useful for designing and evaluating comprehensive curricula which may include one or more of a large number of different media, including computer-assisted instruction. Without a method of evaluating the use of these media, and their timing, it is impossible to make ongoing decisions about a more effective curriculum design.

Developments in the Technology of Special Education

In order to meet the educational objectives for the individual handicapped child, the special education curriculum is increasingly designed to focus on (a) the total classroom environment, (b) the effective use of a variety of media, (c) the process for implementing and evaluating the plans, and (d) the behavior of the child. These four features of curriculum design together are important to educational technology, the growth of which can be attributed in large measure to the influences just described and to the development of the instrumentation and procedures which have made its application possible.

Based on the urgent rationale that effective teaching on a large scale requires that educators either model the master teacher or master the teaching model (Stolurow, 1965), educational technology has followed two lines of development. Educational technology refers both to hardware (automated and non-automated instrumentation) and to a systematic process of instruction, regardless of the media used for presenting the information of the curriculum (Gagne, 1968). Either dimension of educational technology is actually a process whether the presentation of instructional stimuli is planned, implemented, and evaluated through instrumentation or accomplished

systematically by the educator himself (Henrich, 1968). Instrumentation and automation are seen as the product of technology. But the total gains from technology are not achieved without the full use of systematic instructional procedures. In the early stages of the application of technology the special educator borrowed bits and pieces to apply to his instructional design. With increasing refinements in behavior modification and intervention, however, the educator is beginning to specify his requirements of technology. Such interrelationship can only result in benefits for technology as well as education.

Any process of instruction that includes the identification of behavioral objectives and a process by which they will be carried out and evaluated is an example of the application of technology. Thus educational technology can be applied at any level to the solution of instructional problems.

In the natural setting educational technology is being applied in two ways: 1) through automated and non-automated media for display and measurement as part of the task of instruction, and 2) as a set of procedures which systematize instruction (Silverman, 1968).

Educational Technology as Automated and Non-Automated Media

Over the past two decades automated and non-automated media have shown an accelerated growth in the types available as well as in their frequency of use. Programmed and non-programmed materials, very simple teaching machines like the Bell and Howell Language Master (Crouch, 1967) the World Book Cyclo-teacher, and the overhead projector (Wyman, 1969)

and the very complex instrumentation of computer-assisted instruction well represent the range of media available. Each type of medium, regardless of its simplicity or complexity, has one or two functions: either it displays instructional stimuli or it provides both a display of stimuli and some measurement of performance.

Display media. Media which display information (Silberberg & Silberberg, 1969) are extensive and abundant. For example, educational television, films, film strips, and slides have been available to the special class for a long time. Programmed instruction is a much newer development, offering much greater opportunity for individualized instruction. The feasibility of programmed instruction has been demonstrated on children with all types of exceptionalities--mental retardation, slow learner, speech deficit, aphasia, school dropout, deafness, and cultural deprivation (Pfau, 1969). It has been especially used where their learning deficits have involved the lack of skills in initial reading, math, spelling, written language, and handwriting (Haring, 1970). Programmed materials designed around other content areas have had limited applicability to handicapped children because the reading requirements are too difficult.

Display and measurement media. Teaching machines--in any degree of complexity--provide capabilities of both display and performance measurement to facilitate educational objectives for the child. One of the simplest and most functional to date has been the Language Master, manufactured by Bell and Howell, which can present and record auditory stimuli to develop both visual and auditory discrimination and which can

be easily managed by the young child. It is an excellent illustration of a medium that can facilitate individualized instruction inexpensively.

Some machines feature specific types of display to suit a handicapping condition, such as those used in Project LIFE (Pfau, 1969) for hearing impaired children. These machines feature a master-response control unit for teaching reading skills to deaf children as early as five years of age.

Another form of instrumentation--the conjugate reinforcement servo*--has been developed and used to measure the preferences for various types, rates, and degrees of intensity in the auditory presentation of information to mentally retarded individuals (Lovitt, 1968). Through conjugate reinforcement, two variations in auditory stimuli are simultaneously available for presentation to the child who indicates by his response pattern on a handswitch which variation he prefers. The potential offered by such precision in response measurement for assessment of skills and for evaluation of instructional conditions, as they affect performance, has barely been tapped.

The Talking Typewriter (Moore, 1963) has, in the recent past, offered a semi-computerized program in elementary reading for autistic, mentally retarded, and maladjusted children (Pines, 1965), and is currently being evaluated with disabled readers (Zaslav & Frazier, 1969). Although research results have not been obtained to substantiate the success of this instrument, many users have been highly pleased with, at least, short-term effects.

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The most complex teaching machine is the computer, now at a stage of development where software programs are becoming available in very elementary form to assist the ongoing program of classroom instruction in one of several subjects.

Following the development of programmed instruction and teaching machines as the two major educational developments of the late 1950's and early 1960's, the computer, as it assists instruction, promises to be the major educational development of the late 1960's and early 1970's (Feldhusen & Szabo, 1969). Most computer programs to date have involved computer-assisted instruction (CAI) rather than developmental programs, and, although by 1968 five hundred public and private schools had had some degree of CAI programming as part of the curriculum (University of Washington Summer Computer-Assisted Instruction Project, 1969) and 25,000 children below college level to date have had some degree of exposure, only about 1,000 children in special education classrooms have had this opportunity.

Currently, only five programs for handicapped children have included the computer as part of the curriculum design. The Experimental Education Unit of the Child Development and Mental Retardation Center at the University of Washington presented a summer CAI program to children exhibiting a wide variety of handicapping conditions as well as to a group of deaf children (University of Washington Summer Computer-Assisted Instruction Project, 1969). The program of drill-and-practice in arithmetic, emanating from Stanford University, was utilized in an initial attempt to evaluate the

efficacy of CAI for teaching handicapped children. Stemming from this groundwork, there is currently underway, within five selected school districts in King and Pierce Counties, and at the Experimental Education Unit, a more extensive CAI project. A total of 22 terminals, provided with input from a local computer facility, will be placed in different settings for children having a wide range of ages and handicapping conditions. The concern of the project, as children are instructed in elementary math and language, centers primarily (a) on the efficacy of CAI for handicapped children, (b) on the conditions which might increase its effectiveness, and (c) on the training necessary to prepare teachers and administrators to utilize the features of CAI in ways that facilitate instructional objectives. Probably the most unique feature of the project is the acid test to be given the expensive presentation of stimuli the computer provides when comparisons are made with student performance in a parallel program presented in workbook format. In addition to comparing learning rates to stimuli with and without the computer, the project is directed at determining (a) optimal conditions for evaluating the project, (b) optimal length of terminal use by the child, and (c) the influence of different settings and different reinforcement conditions on the adequacy of CAI programming.

Gallaudet College (Finch, 1968) is conducting a pilot project using an arithmetic drill-and-practice program for deaf children with computer input from Stanford University. It is also developing a model secondary school for the deaf which will include capabilities for the use of the computer in meeting instructional objectives.

Four educational settings in Oregon participate in a mobile CAI program which teaches problem solving and "understanding computers." Students at the Oregon School for the Blind, the Oregon School for the Deaf, the State Penitentiary School, and McLaren School for Boys (Pembroke, 1968) respond to these programs on a periodic basis.

A third computerized program (Lang, 1969) is in the experimental stages for automating Wolpe's (1958) behavioral therapeutic technique for desensitizing phobias. Early results show that this on-line computerized presentation of stimuli associated with the phobia and adjusted according to the patient's pattern of response is just as effective as using a live therapist. This new development promises to be an effective approach to the treatment of other psychopathological processes.

One other computer program relevant to the needs of handicapped children involves a mobile instruction unit (CAI Study Designed to Help Student with Minor Handicap, 1969) being developed to present inservice training to classroom teachers to give them skills to identify minor handicapping conditions such as vision and hearing deficits. When a program such as this can be extended to include training in the identification of behavior and learning deficits, using identification procedures which lead directly to improved teaching conditions, computer programming will be extremely functional for professional training in special education.

Other machines, mostly in the design or early development stage, feature prosthetic devices which can assist the child to make the necessary

responses, such as a computer terminal that would have response keys embossed with braille (Blackhurst, 1965).

A view of computer programming currently available to children in regular classrooms provides a panorama of its applicability to the needs of exceptional children. Regular class elementary and secondary students (not to mention college students) in California, Kentucky, Mississippi, Tennessee, Pennsylvania, New York, Michigan, and Washington respond to computer programs for elementary reading, math, spelling, mathematical logic, social studies, grammar, vocational and technical skills problem solving, and "computer understanding" (Jerman, 1969). To any one student only one or two of these programs is available, however. Most of these programs are supplementary curriculum programs of drill-and-practice. An increasing number are beginning to be tutorial, thus more developmental. Tutorial programs, including those involving simulation, are geared to the answers and questions the child presents to the computer, a further advancement in individualized instruction.

Although the results of CAI programs with various groups of mostly normal children do not definitely identify whether or not the skills developed have been accomplished more effectively than when the teacher presents the same information, results do show that instruction is equalized from child to child when using CAI. Undisputedly CAI has had its greatest effects in geographical areas where educational opportunities are lacking and socio-economic standards are low (Suppes & Morningstar, 1969).

Computers offer tremendous promise to education when used with good software and when their use is evaluated within a larger curriculum design. Suppes (1968) predicts that within the next five years the drill-and-practice programs in math and reading, alone, will reach between 200,000 and 800,000 children. Furthermore, he predicts that in ten years this application may reach between one and ten million. In addition to their contributions to skill development for both the handicapped child and the teacher, computers will facilitate educational research designed to explore the variables of the teaching-learning process.

These media, in addition to their value in display and measurement, have also proven to have reinforcing value and can be used to motivate performance.

Any medium, however, is only as effective in achieving educational objectives as the effectiveness of its specific application. If this form of technology is to benefit special education, it must not simply be appended to current instructional approaches, but instead must be incorporated into the operational program in such a way that instructional objectives are facilitated. Systematic plans must be designed for the use and evaluation of media in line with instructional objectives for the individual child. The use of electronic, mechanical, and electromechanical devices to speed up the process of learning will reshape our previous concept of the teacher as a key professional who supports the learning process, for his role will be both managerial and supportive (Joyce, 1969).

The importance of these media to special education is registered in the increasing demand for curriculum or instructional materials or media specialists (Kraft & Latta, 1969; Watson, 1968; Kelley, 1969) to assist the teacher in planning for instruction. It is also seen as important in the development of two types of media centers, one within the school building (Herman, 1969; Owen & Compton, 1968; Wood, 1969; Singer, 1968) for use by the child and the other often within its own structure (King, 1969) to provide for the teacher the dissemination, evaluation, and further development of all forms of media.

Media specialists. The great variety of available instructional material and media has spawned a need for a new specialist--the instructional material or media specialist (Glaser, 1968). This specialist will be concerned with the effective use of all instructional resources to promote the most learning with the least time and expense. His primary responsibility is to assist the teacher in the use of available resources to meet his stated objectives. His focus is and will be to design curriculum plans that include the teacher's activities, the use of materials and other media, as well as the interaction of both. With the increased expectations of instructional and media specialists, however, it probably would be too much to expect one person to assume responsibilities for equipment as well as for materials. The earlier expectations that librarians should assume the role of audiovisual specialist and materials specialist might serve as a lesson here. Because of the total needs of both areas and the diverse service requests, their attempts were not entirely satisfactory. Quite probably the "audiovisual

specialist" of the schools of yesterday will be the instructional materials specialist of the schools of tomorrow.

A hierarchy of educational planners is actually developing. The prototype for any specialist in this hierarchy may well be the resource teacher (Haring, 1969) whose role has most recently been refined through training in the use of classroom measurement and evaluation procedures that focus on the process of instruction. Resource teachers have been trained to help the special class teacher directly with instructional plans designed to meet specific problems in classroom management and instruction.

Educational planners within the next ten years will also function at the school district level where the task of curriculum design increases in complexity with an increase in the number of variables to consider.

Where curriculum specialists operate from Instructional Materials Centers, they may be directly responsble for instruction to children who come to the Center periodically for individualized programming. These specialists increasingly will have at their disposal a variety of information retrieval systems. Even computer-assisted instruction and the talking typewriters are coming under the direction of the instructional materials specialist (King, 1969).

Media centers: Local and national. Media centers at the school level are being designed for easy access and independent use by the student, whether within the classroom (Weisgerber & Rahmlow, 1968) or another room. Both settings are increasingly useful in providing the

student with a large amount of information through a variety of media as he is guided toward terminal objectives. These centers, when well equipped to provide information, may include individual carrels having "dial access" to a computer storing a wide variety of information for problem solving, individual use of filmstrips, movies, discs, tapes, and programmed instruction integrated with multi-media formats. They are staffed by specialized personnel.

Use of these facilities varies widely, currently. Some are used simply to provide the child the opportunity to browse for information. Others are used when the child is to make a specific report or to bring to the attention of the child specific areas of interest. These facilities will be used most effectively, however, when they are programmed as part of the child's total curriculum activity where it is planned that at a certain time the use of the center will facilitate specific skills (Gerletti, 1969).

On the national level several types of media centers have been organized for the dissemination, evaluation, and development of media to implement the design of curriculum for exceptional children. Directly and indirectly they are also involved in teacher training. Since the development of four centers for the deaf (McIntyre, 1969), the Instructional Materials Center (SEIMC) Network for Handicapped Children and Youth (Erickson, 1969) has been developed and is becoming an effective program for the dissemination and demonstration of a wide variety of instructional resources. The seventeen special education centers

comprising the network (a) contain libraries of instructional materials to be used by personnel in the area; (b) publish regular newsletters and provide library services by mail; (c) sometimes provide field specialists; (d) sometimes have mobile units for reaching the teachers; and (e) coordinate a system to centralize information in conjunction with the CEC Information Center. Overall, the centers provide consultation, inservice training meetings, and information on educational methods and media. The CEC Information Center (Soeffing, 1969) is one of the ERIC Clearinghouses which prints abstracts of publications in the literature of special education and abstracts of available instructional materials. The National Media Center for the Handicapped (Ofiesh, 1969) is the most recently developed national program. This center will provide the additional feature of a demonstration school.

Systematic Instruction in Special Education: The Second Form of Educational Technology

Educational technology as systematic instruction or as a systems approach to achieving educational objectives was not initially singled out as a technology in its own right, although it was a necessary parallel to the development of non-automated and automated technology. Today, however, it is recognized as a technology whether functioning with or without instrumentation or programmed instruction. It is more comparable to the broad definition of programmed instruction, i.e., programmed environment.

This form of technology is characterized by three major features of instruction: (a) systematic arrangement of conditions for learning; (b) continuous measurement of child performance; and (c) evaluation of the overall effect of the instructional conditions. This form of technology has progressed to the point where, in the classroom, it primarily involves procedures of continuous measurement of child performance. In addition, because teachers using these procedures have identified behaviorally the skills they expect to see the child achieve and the intervening steps in the development of these skills, these teachers are able to assess where each child is in relation to the objectives and the stimuli that might be selected and sequenced to begin an individualized program. Precise identification and sequencing of specific conditions of instruction require attention to: 1) those stimuli that occur before the child responds to the task; 2) those that occur immediately after each unit of response to each "bit" of the task; and 3) those events or reinforcers that can be provided after the total task is completed. It has become essential to attend not only to the conditions which cue or prompt the desired response, but also those which motivate performance, thus maintaining attending and responding accurately to a task.

This is not a methods approach to instruction but an instructional process. Although a methods approach and a systems approach to instruction both involve a set of procedures, a systems approach includes a procedure for continuous measurement and systematic evaluation of results, which may in turn change the original input. The lack of built-in

measurement procedures in a methods approach may result in perpetuation of that method without reliable evaluations. Requirements of this second dimension of technology parallel the requirements of instrumentation. That is, both require, as part of the process of instruction, the determination of precise behavioral and instructional procedures. Together they permit valid information to be obtained from the child's performance that reliably reflects the effects of the curriculum design. This means total programming of the instructional environment during intervals of each daily class session when the teacher's activities are directed toward specified objectives.

The application of this dimension of technology has reached such a degree of precision in some educational settings, mainly special classes, that a central data bank is in the developmental stages which will evaluate and disseminate information on conditions that cue and reinforce child performance. Specially designed computer forms* have been prepared on which the teacher or researcher is to identify the instructional conditions used as well as the relevant behavioral data about the child's performance under these conditions. Data from projects conducted anywhere in the country using procedures adapted from those of experimental analysis, can be pinpointed and summarized on these forms which are then sent to the data collection center in Kansas. Although the use of these forms is in a very early stage of development, it is a direction that is bringing research procedures into the classroom as instructional procedures, producing results precise enough to be replicated by others and to be used as information to store for future access.

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Within this area of educational technology, special education will be credited with providing a ball park for the application of a precise adaptation of procedures of experimental analysis (Lindsley, 1964; Haring & Phillips, in press), a major contribution to the beginnings of a behavioral science base to instruction (Glaser, 1965).

New Factors of Curriculum Design

New curriculum design in special education is characterized by the achievement of an ever increasing degree of individualization of instruction. It is, secondly, characterized by a systematic approach for designing, implementing, and evaluating (using child performance data) the process of instructing the child so that he acquires specific information and specific behaviors. There is, thirdly, a greater emphasis on academic content, with, in addition to a wide variety of printed media, the use of instrumented media wherever feasible for accomplishing terminal objectives efficiently in terms of time and cost. Fourth, as opposed to initial concentration on deviant behaviors or other special handicapping conditions, there is an evaluation of entering academic, social, and verbal behaviors of the child that leads directly to educational programs that modify and build on these repertoires, thus emphasizing the rapid developmental potential of early childhood rather than the deviance. The new preschool programs for handicapped children, now subsidized by Public Law 90-538, underscore the fact that there is no need to wait, for example, for the development of eye-hand coordination and form and letter discrimination before beginning instruction. In early childhood, many skills are not as dependent on readiness as they are on training. This fact, alone, is having a powerful effect on curriculum design.

New Curriculum Design as Total Programming

New curriculum design in special education reflects the glimmerings of the science of teaching. The most comprehensive application of the new curriculum design in special education takes one of two forms. One type of application involves the addition of some form of CAI to classroom instruction in an additive way, although not as a coordinated part of the total curriculum design. The other type involves the use of systematic procedures applied to some portion of the total curriculum each day. As yet, no programs involve a design using both complex instrumentation and systematic instructional procedures, other than those built in to the software program.

Programs primarily involving instrumentation, which have already been identified, are self-contained. As these instrumented programs meet objectives for which they were designed and employed they represent total programming for the duration of stimulus presentation. However, the curriculum of special education is broader than the technology of instrumentation can supply, at least at present.

The special class teacher as he applies the new design, selects and arranges environmental conditions and events as they play a role in instruction. These conditions and events are not only those that prompt specific types of responses from the child, but also specific conditions which do and can function to reinforce classroom performance--reinforcement being the key factor in motivation (Ferster, 1961; Nolen, Kunzelmann, & Haring, 1968; Girardeau & Spradlin, 1964). The specific features of

the new design also materialize as the teacher incorporates procedures of continuous measurement of performance into his daily instruction. When teachers plan and carry out instruction in line with the new design, they are engaged in a type of engineering as they construct an educational environment designed to shape student thinking and behavior.

Examples of the Application of New Curriculum Design

There are a number of examples of the new curriculum in classrooms across the country. Within any of these programs currently exemplifying new curriculum design, several new factors which advance instruction are prominent. All involve technology and measurement. The two major factors in these programs are the selection and arrangement of environmental conditions and events which influence learning. In many ways these programs represent either the application of a systems analysis or the application of a more precise set of procedures--experimental analysis. These programs are systems or processes of instruction as they embrace: terminal objectives, a program of instruction, measurement, and evaluation of the achievement of objectives.

The new design, represented by various adaptations of the basic features, is visible under a number of different labels: experimental education (Haring, 1970), precision teaching (Lindsley, 1964), behavior modification (Haring & Hayden, 1969), engineered classroom (Hewett, 1967), contingency management (Haring & Kunzelmann, 1966; Haring, in press), and contingency contracting (Homme, 1969). Regardless of the label, this new design is being applied widely to handicapped children (a) exhibiting

all types of exceptionalities (Haring & Kunzelmann, 1966; Nolen, Kunzelmann, & Haring, 1968); (b) mentally retarded (Birnbrauer, Wolf, Kidder, & Tague, 1965; Girardeau & Spradlin, 1964); (c) severely disabled in reading (Haring & Hauck, 1969); and children with (d) conduct problems (Quay, Werry, McQueen, & Sprague, 1966; Becker, Madsen, Arnold & Thomas, 1967) and emotional disturbances (Hewett, 1968). This design is also being applied extensively to children disadvantaged (Wolf, Giles, & Hall, 1968) and delinquent (Tyler & Brown, 1967).

The technological significance of each of these exemplary programs is that each describes a direction, how to get there through the instructional program and other experiences, and a way to evaluate where the child is in relation to the design. In addition, each program focuses not on the deviancies but on the behavioral deficits of children, a focus on accelerating positive behaviors rather than on decreasing a pathology. In this way curriculum is designed to build terminal objectives similar to the specific performance expectations required for normal children, as well as the additional objectives necessary for effective work with handicapped children.

A number of methods are also being used with exceptional children in addition to these exemplary programs. When these methods begin to incorporate terminal objectives, which the selected materials and experiences are arranged to achieve, and when evaluation procedures are also included as part of the process of instruction, they too will become systems of instruction.

The best curriculum design in special education will incorporate both dimensions of technology to the fullest. Within a systematic curriculum designed to meet specific objectives, several forms of non-automated as well as automated media including the computer, where feasible, will be employed and evaluated. This approach permits continuous revision of the process in the original design to accomplish the desired product.

Summary

New curriculum design in special education shows a convergence of two strong influences: 1) the recognition of the importance of individualized instruction and 2) the growing effect of the procedures of experimental analysis with an emphasis on the individual child and the conditions which, when applied to well-defined behaviors, produce specific results. In contrast to the design of the curriculum of the past, the new design in the curriculum of special education is broader, possibly more content oriented, certainly directed at the behavioral components of learning, totally defined in behavioral terms, and managed within a system.

What appears to have emerged as the overall curriculum design is the technology of teaching or teaching according to applied scientific principles of behavior. This means the use of systematic procedures and the inclusion of instrumentation where economically feasible and functionally appropriate for effective individualized instruction. In particular the design builds on sequences of behaviors (or behavioral chains) and begins with a focus on early childhood for more effective prevention and amelioration.

The new curriculum design underscores three important features of instruction. First, academic skills can and should be developed through systematic arrangements of cues, placing the teacher in a managerial role for designing, implementing, and evaluating curriculum. Second, materials and other media used to cue responses should be selected and arranged so

as to prompt equal response units. In this way a continuous measurement of performance can be obtained that reliably reflects the effects of the materials and instructional procedures. Third, decisions concerning instructional conditions are based on this continuous record of performance.

Great variation in the application of educational technology can be observed throughout special classes and programs for exceptional children. In some classes the most advanced use of instrumentation, educational media and resources is being demonstrated. Still in other special classes the methods, materials and equipment being used have not advanced too far from Seguin's time. Certainly rapid change in instructional procedures and materials is being effected for which educational technology is responsible in large measure.

Observation of the current curriculum design in special education not only reveals remarkable variation in precision, but also (a) growth in the application of more scientific procedures, and (b) increasing visibility of the new design in a number of programs. Teachers are changing from dramatic artists to managers of all resources available for instruction.

There is reason to believe that educators will look toward special education for the opportunity to use more precise procedures for instruction. This development in special education is the growth of a new discipline, which, as Silverman (1968) describes it, is "midway between the science of learning and the day-to-day practical problems of teaching. This new discipline would require people trained in behavioral science, exposed to the problems of teaching, and unafraid of devices" (p. 3) and of measurement procedures that permit evaluation of instruction.

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